What is claimed is:

1. An ion implantation system suitable for use in implanting ions into one or more workpieces and for detecting particle on the workpieces comprising:

an ion implanter for producing a beam of ions and directing the beam of ions downstream toward the one or more workpieces held within an end station, the end station comprising:

a rotary scan transport for providing rotary motion to the workpieces and an encoder count of the radial scan position; and

a linear scan transport for providing reciprocating linear motion to the workpieces and an encoder count of the linear scan position; and

an *in-situ* monitoring system associated with the end station suitable for detecting particles on the one or more workpieces during ion implantation comprising:

a light source for providing a fixed beam of illumination to a portion of one of the workpieces;

a detector for capturing scattered light from the illuminated portion of the workpiece; and

a processor configured to analyze the intensity of the scattered light detected from the illuminated workpiece, and for mapping the light detected to a unique position on a workpiece determined by the encoder counts associated with the rotary and linear transports.

2. The system of claim 1 further comprising a display device coupled to the processor for displaying patterns of the scattered light mapped to the unique position on the workpiece.

3. The system of claim 1, wherein the processor is further operable to

analyze the light mapped to the unique position on the workpiece and determine whether such position corresponds to a particle, scratch, feature, feature damage, or temperature of the workpieces.

4. The system of claim 3, wherein the processor is further operable to trigger a system alarm based on a comparison of the pattern determination to a threshold level of one of the detected particles, scratches, features, feature damage, and the temperature of the workpieces.

5. The system of claim 1, wherein the one or more workpieces comprise one or more semiconductor wafers.

6. The system of claim 1, wherein the light source comprises a laser.

7. The system of claim 6, wherein the laser light source is directed toward the workpiece using an optical fiber.

8. The system of claim 6, the detector further comprising a laser beam trap to extinguish specular reflection of scattered light from the laser.

9. The system of claim 1, wherein the processor comprises a computer.

10. The system of claim 1, wherein the detector comprises a photo-multiplier tube or a photodiode.

11. The system of claim 1, wherein the *in-situ* monitoring system comprises two detectors affixed on either side of the light source and oriented toward the

illuminated portion of the workpiece.

12. The system of claim 11, wherein the light source comprises a laser.

13. The system of claim 12, the detector further comprising a laser beam trap to extinguish specular reflection of scattered light from the laser, the trap located between the two detectors.

14. The system of claim 1, further comprising a display device coupled to the processor for displaying patterns of the light mapped to the unique positions on the one or more workpieces.

15. The system of claim 1, wherein the ion implantation system comprises a batch implanter.

16. The system of claim 1, wherein the ion implantation system comprises a spinning disc batch implanter.

17. The system of claim 1, wherein the workpieces are held in the end station at a non-zero angle relative to a plane of the rotary motion, the detector further comprising a slit to pass the scattered light imaged to the detector and also to mask specular reflected light from the light source from saturating the detector.

18. The system of claim 1, wherein the detector further comprises:
a first lens to collimate the scattered light;
a filter to absorb unwanted wavelengths of the light;
a second lens to focus the light; and

a slit used to pass the scattered light to the detector and also to mask specular reflected light from saturating the detector.

19. The system of claim 18, wherein the scattered light passes from the first lens to the detector in an optical column, the order of the optical column comprising: the first lens, the filter, the second lens, the slit, and the detector.

20. The system of claim 1, wherein the detector comprises a two dissimilar detectors, wherein one detector monitors scattered light from the workpiece and the other detector monitors one of scattered light, infrared radiation, and a wavelength of the electromagnetic spectrum.

21. A system for detecting particles on one or more workpieces of an ion implantation system, the system comprising:

an ion implanter for producing a beam of ions and directing the beam of ions downstream toward the one or more workpieces held within an end station, the end station comprising:

a rotary scan transport for providing rotary motion to the workpieces and an encoder count of the radial scan position; and

a linear scan transport for providing reciprocating linear motion to the workpieces and an encoder count of the linear scan position; and

an *in-situ* monitoring system suitable for detecting particles on the one or more workpieces during ion implantation, the system comprising:

a light source for providing a fixed beam of illumination to a portion of one of the workpieces;

a detector for capturing scattered light from the illuminated portion of the workpiece; and

a processor adapted to analyze the intensity of the scattered light detected from the illuminated workpiece, and for mapping the light detected to a unique position on a workpiece determined by the encoder counts associated with the rotary and linear transports.

22. The system of claim 21 further comprising a display device coupled to the processor for displaying patterns of the scattered light mapped to the unique position on the workpiece.

23. The system of claim 21, wherein the processor is further operable to analyze the light mapped to the unique position on the workpiece and determine whether such position corresponds to a particle, scratch, feature, or feature damage.

24. The system of claim 23, wherein the processor is further operable to trigger a system alarm based on a comparison of the pattern determination to a threshold level of one of the detected particles, scratches, features, feature damage, and the temperature of the workpieces.

25. The system of claim 21, wherein the one or more workpieces comprise one or more semiconductor wafers.

26. The system of claim 21, wherein the light source comprises a laser.

27. The system of claim 26, wherein the laser light source is directed toward the workpiece using an optical fiber.

28. The system of claim 26, the detector further comprising a laser beam

trap to extinguish specular reflection of scattered light from the laser.

29. The system of claim 21, wherein the processor comprises a computer.

30. The system of claim 21, wherein the detector comprises a photo-multiplier tube or a photodiode.

31. The system of claim 21, wherein the *in-situ* monitoring system comprises two detectors affixed on either side of the light source and oriented toward the illuminated portion of the workpiece.

32. The system of claim 31, wherein the light source comprises a laser.

33. The system of claim 32, the detector further comprising a laser beam trap to extinguish specular reflection of scattered light from the laser, the trap located between the two detectors.

34. The system of claim 21, further comprising a display device coupled to the processor for displaying patterns of the light mapped to the unique positions on the one or more workpieces.

35. The system of claim 21, wherein the ion implanter comprises a batch implanter.

36. The system of claim 21, wherein the ion implanter comprises a spinning disc batch implanter.

37. The system of claim 21, wherein the workpieces are held in the end station at a non-zero angle relative to a plane of the rotary motion, the detector further comprising a slit to pass the scattered light imaged to the detector and also to mask specular reflected light from the light source from saturating the detector.

38. The system of claim 21, wherein the detector further comprises:

a first lens to collimate the scattered light;

a filter to absorb unwanted wavelengths of the light;

a second lens to focus the light; and

a slit used to pass the scattered light to the detector and also to mask specular reflected light from saturating the detector.

39. The system of claim 21, wherein the scattered light passes from the first lens to the detector in an optical column, the order of the optical column comprising: the first lens, the filter, the second lens, the slit, and the detector.

40. The system of claim 21, wherein the rotational and linear motion transports comprise one or more motion drives used to provide a compound motion for the detection scanning and ion implantation scanning of the wafers.

41. The system of claim 21, wherein the rotational and linear motion transports comprise separate drive motions for the detection scanning and ion implantation scanning operations.

42. The system of claim 21, wherein the detector comprises a two dissimilar detectors, wherein one detector monitors scattered light from the workpiece and the other detector monitors one of scattered light, infrared radiation, and a

wavelength of the electromagnetic spectrum.

43. A method of particle detection on one or more workpieces within a spinning disk ion implantation system during ion implantation having an *in-situ* monitoring system comprising one or more detectors and a light source, the method comprising:

spinning the workpieces;

implanting ions into the workpieces by directing an ion beam toward the workpieces on the spinning disk;

illuminating the one or more workpieces by directing a light beam from the light source toward the workpieces; and

detecting scattered light from one or more workpieces.

44. The method of claim 43, further comprising analyzing the detected scattered light corresponding to a position of the spinning disk to determine patterns of light corresponding to particles.

45. The method of claim 44, wherein the number of particles detected on one or more workpieces are counted.

46. The method of claim 45, wherein the particles count number is compared to a threshold level of particles to disable the ion implantation operations.

47. The method of claim 43, further comprising displaying the detected scattered light.

48. The method of claim 43, wherein the detection takes place before ion implantation operations.

49. The method of claim 43, wherein the detection takes place after ion implantation operations.

50. The method of claim 43, further comprising detecting a magnitude of the scattered light and estimating a size of a detected particles based on the detected magnitude.

51. The method of claim 50, further comprising binning a plurality of detected particles into one of a plurality of bins associated with estimated detected particle ranges.

52. The method of claim 51, further comprising investigating one or more particle contamination sources based on the binning of the detected particles.

53. An ion implantation system suitable for use in implanting ions into one or more workpieces and for detecting particles on the one or more workpieces, comprising:

an ion implanter configured to provide a scan transport to the one or more workpieces with respect to an ion beam; and

an *in-situ* monitoring system suitable for detecting particles on the one or more workpieces, comprising:

a light source configured to provide a beam of illumination to a portion of the one or more workpieces; and

a detector configured to capture scattered light from the illuminated

portion of the one or more workpieces.

54. The ion implantation system of claim 53, further comprising a processor configured to analyze the intensity of the scattered light detected from the illuminated portion of the one or more workpieces.

55. The ion implantation system of claim 54, wherein the processor is further configured to map the light detected to a unique position associated with the one or more workpieces.

56. The ion implantation system of claim 55, further comprising an encoder configured to provide an encoder count indicative of a scan position.

57. The ion implantation system of claim 53, wherein the transport comprises a linear scan transport for providing a reciprocating linear motion to the one or more workpieces with respect to the ion beam.

58. The ion implantation system of claim 57, wherein the transport further comprises a rotary scan transport configured to provide rotary motion to the one or more workpieces with respect to the ion beam.